

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended, is respectfully requested.

Claims 1-6 and 14-17 are pending in this application. Claims 7-13 are canceled by the present response without prejudice and new claims 15-17 are presented herein. Claims 12 and 13 were objected to for informalities. Claims 1-4, 9, and 13-14 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. patent 5,675,648 to Townsend. Claims 5 and 6 were rejected under 35 U.S.C. § 103(a) as unpatentable over Townsend in view of U.S. patent 6,307,984 to Watanabe. Claims 7-8 and 10-12 were rejected under 35 U.S.C. § 103(a) as unpatentable over Townsend in view of the publication "Multiphoton detection using visible light photon counter" to Kim et al. (herein "Kim").

Initially, applicant and applicant's representative wish to thank Examiner Sohn for the interview on July 14, 2005. During the interview the outstanding rejections were discussed in detail. Further, during the interview claim amendments were discussed to clarify the claims over the applied art. The present response sets forth the discussed claim amendments. Examiner Sohn indicated he would further consider such amended claims when formally presented in a filed response.

Addressing first the objection to claims 12 and 13, those objections are traversed by the present response as those claims are canceled by the present response without prejudice.

Addressing now the prior art rejections based on Townsend, Townsend in view of Watanabe, and Townsend in view of Kim, those rejections are traversed by the present response.

Independent claim 1 is amended by the present response to incorporate limitations from previously pending dependent claims 7 and 11. To that extent independent claim 1 now further recites a pulse height discriminator and the controller including:

a clock generator;
a gate operation frequency judging section for
controlling the gate device to be opened or closed for
less than a specified number of times within a
predetermined time defined by a clock signal of the
clock generator.

According to such a feature in the present invention, and with reference to Figures 9 and 10 in the present specification as a non-limiting example, a clock generator 37 generates a clock signal supplied to the controller, the controller in turn controlling the gate device 4. By utilizing such a structure and operation, and as discussed in the present specification with respect to Figures 9 and 10, it becomes possible to generate a multiple photon number state at intervals close to uniform intervals.

Such features as now clarified in independent claim 1 are believed to distinguish over the applied art.

With respect to the features recited in previously pending dependent claim 11 the outstanding Office Action cited the combination of teachings of Townsend in view of Kim.

Applicants respectfully submit, however, that neither Townsend nor Kim teaches or suggests controlling the gate device based on a time defined by a clock signal. Townsend discloses for example in Figure 5 a single photon source. In that embodiment in Townsend a photodetector 6 detects photons in one beam, which triggers a gate 7.¹ Townsend does not appear to disclose or suggest that the photodetector 6 operates based on a clock signal. Townsend in that respect does not appear to disclose or suggest any operation similar to that shown for example in Figures 9 and 10 in the present specification.

Further, Kim merely discloses that single or double photons can be detected based on pulse heights. Kim is also silent with respect to utilizing a clock generator to control a gate device, as now recited in amended independent claim 1, and the claims dependent therefrom.

¹ See for example Townsend at column 5, lines 28-30.

During the interview of July 14, 2005, the Examiner raised a concern that the applied art to Townsend may disclose different clock operations, particularly with respect to synchronization in the communication. In respect to that position, Applicants wish to point that the claims as currently written do not broadly recite the use of a clock, but recite the use of a clock for a specific purpose. In the claims the clock controls a gate device, see for example the gate device 4. The claims are not directed to broadly utilizing a clock in a communication device, but to specifically using the clock to control opening of a gate device 4. As discussed in the present specification with respect to Figures 9 and 10 such a control provides benefits in the claimed invention.

In such ways, applicants respectfully submit amended independent claim 1, and the claims dependent therefrom, patentably distinguish over the combination of teachings of Townsend in view of Kim.

The present response also sets forth new dependent claims 15-17 for examination that are believed to further distinguish over the applied art.

New dependent claim 15 further recites “a waveguide channel filter positioned between the photon pair source and photon number generator configured to polarizingly beam split the pair of photons”. Such subject matter is shown for example in the present specification with respect to waveguide channel type filter 22 in Figure 5.

New dependent claim 16 further recites that “the photon number detector comprises plural photon detector elements”. That subject matter is shown for example in Figure 6 in the present specification with respect to photon detectors 26-29.

New dependent claim 17 further recites that the “gate device comprises two shutters”. That subject matter is supported for example in the original specification in the embodiment of Figure 7.

The features recited in new dependent claims 15-17 are believed to be fully supported by the original specification, and to even further distinguish over the applied art.

In view of the foregoing comments, applicants respectfully submit the claims as currently written distinguish over the applied art.

As no other issues are pending in this application, it is respectfully submitted that the present application is now in condition for allowance, and it is hereby respectfully requested that this case be passed to issue.

Respectfully submitted,


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